

Printed Name: \_\_\_\_\_

CHEM 3311, Fall 2009  
Professor Walba  
3rd Hour Exam  
November 19, 2009

scores:

1) 20

2) 20

3) 20

4) 20

5) 20

\_\_\_\_\_

100

CU Honor Code Pledge: On my honor, as a University of Colorado at Boulder Student, I have neither given nor received unauthorized assistance.

Name (printed): Key

Signature: \_\_\_\_\_

Recitation TA Name: \_\_\_\_\_

Recitation day and time: \_\_\_\_\_

This is a closed-book exam. The use of notes, models, calculators, scratch paper, or any other paraphernalia will not be allowed during the exam. Please put all your answers on the test. Use the backs of the pages for scratch.

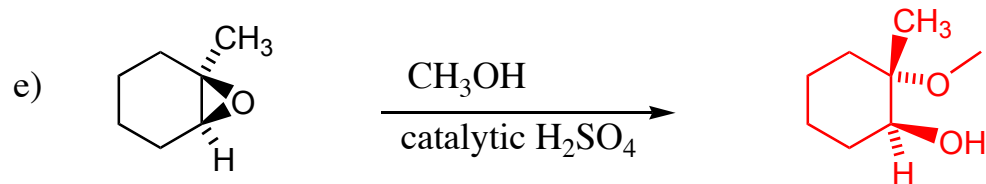
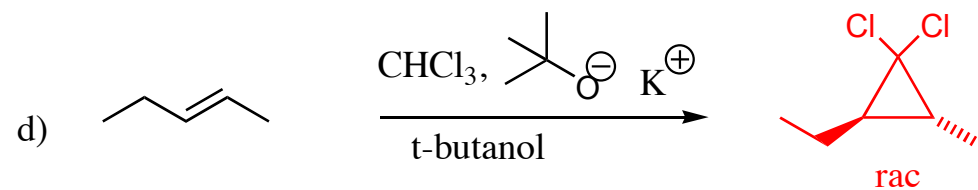
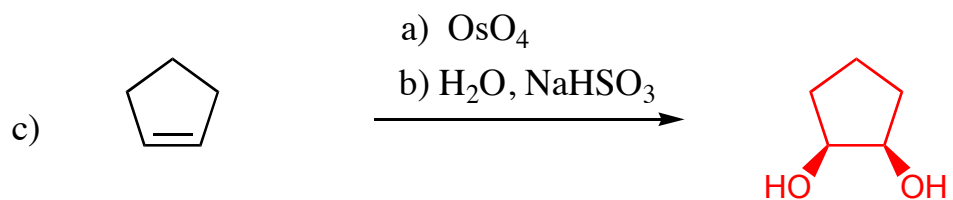
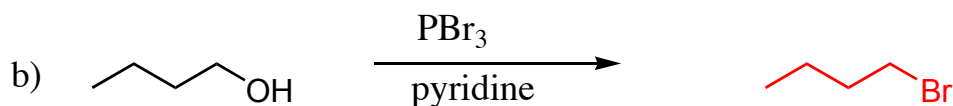
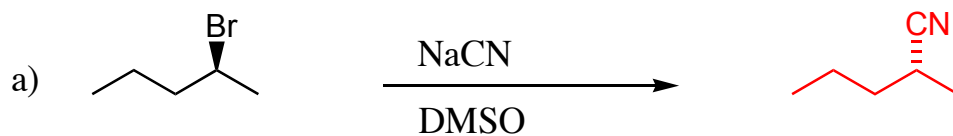
PLEASE read the questions very carefully!

1A							8A
1 H							2 He
	2A						
3 Li	4 Be						
		3A	4A	5A	6A	7A	
		5 B	6 C	7 N	8 O	9 F	10 Ne
		11 Na	12 Mg				
				13 Al	14 Si	15 P	16 S
						17 Cl	18 Ar
						35 Br	
						53 I	

1 (20 pts) For each of the following pairs of compounds, indicate which is the stronger base, and which is the stronger nucleophile. The solvent is indicated below the structures. Each box should have a 1 or a 2 written inside.

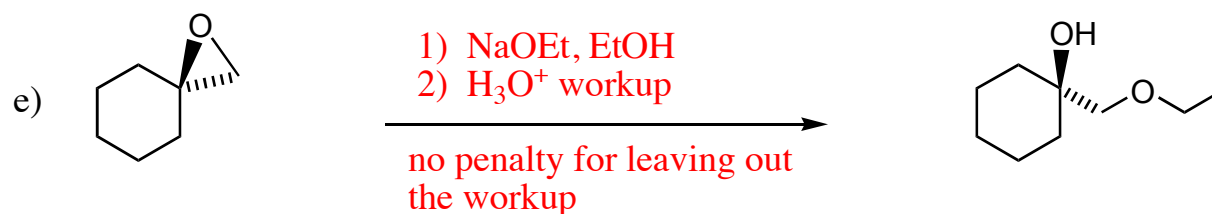
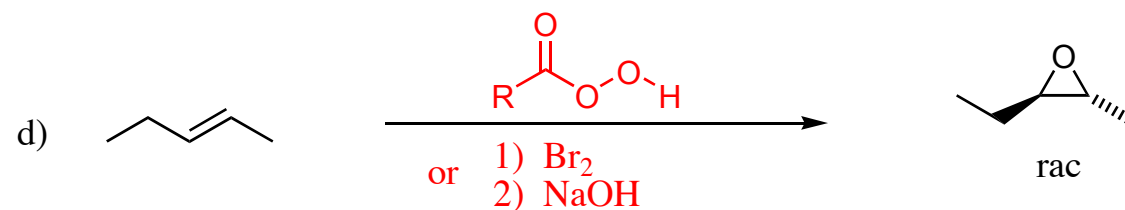
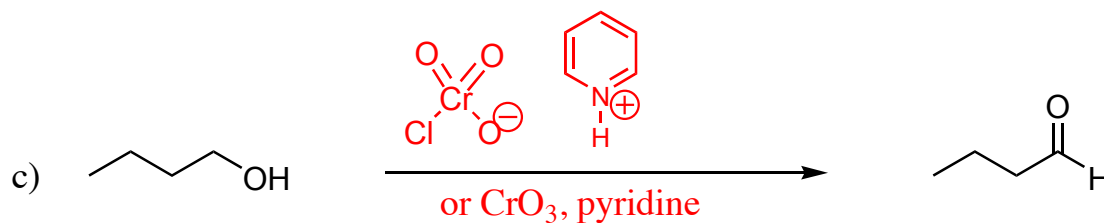
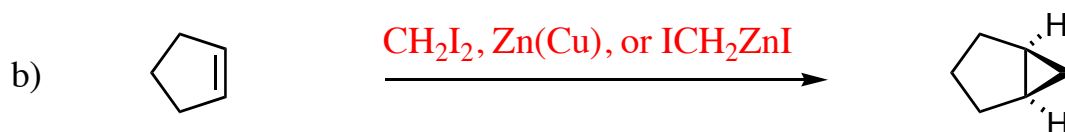
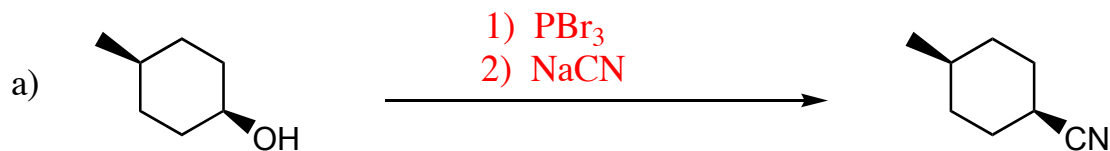
			Stronger Base	Stronger Nucleophile
a)	$\text{CH}_3\text{C}(=\text{O})\text{O}^-$ <b>1</b>	$\text{CH}_3\text{CH}_2\text{O}^-$ <b>2</b>	<b>2</b>	<b>2</b>
	in ethanol			
b)	$\text{I}^-$ <b>1</b>	$\text{F}^-$ <b>2</b>	<b>2</b>	<b>1</b>
	in water			
c)	$\text{HO}^-$ <b>1</b>	$\text{I}^-$ <b>2</b>	<b>1</b>	<b>2</b>
	in water			
d)	$\text{CH}_3\text{O}^-$ <b>1</b>	$(\text{CH}_3)_3\text{CO}^-$ <b>2</b>	<b>2</b>	<b>1</b>
	in methanol	in t-butyl alcohol		
e)	$\text{CH}_3\text{O}^-$ <b>1</b>	$\text{CH}_3\text{S}^-$ <b>2</b>	<b>1</b>	<b>2</b>
	in methanol			

2. (20 pts) Give the single major organic product of each of the following reactions, carefully showing stereochemistry using wedges and dashes. If a racemate is formed, show only one enantiomer of the product, and label it "rac." Assume chiral starting materials are enantiomerically pure unless they are labeled "rac."



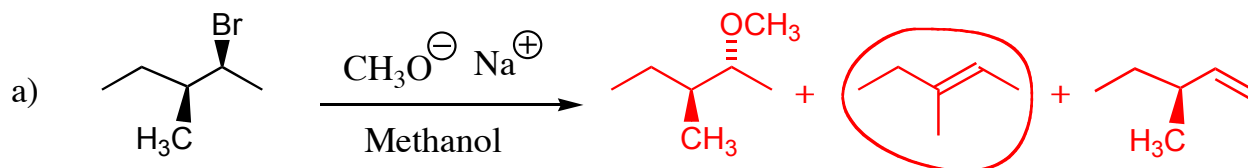
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3 (20 pts) Propose reagents for accomplishing each of the following reactions. Make your reaction efficient (i.e. the target product should be the major product). Assume chiral starting materials and products are single pure enantiomers unless they are labeled "rac."

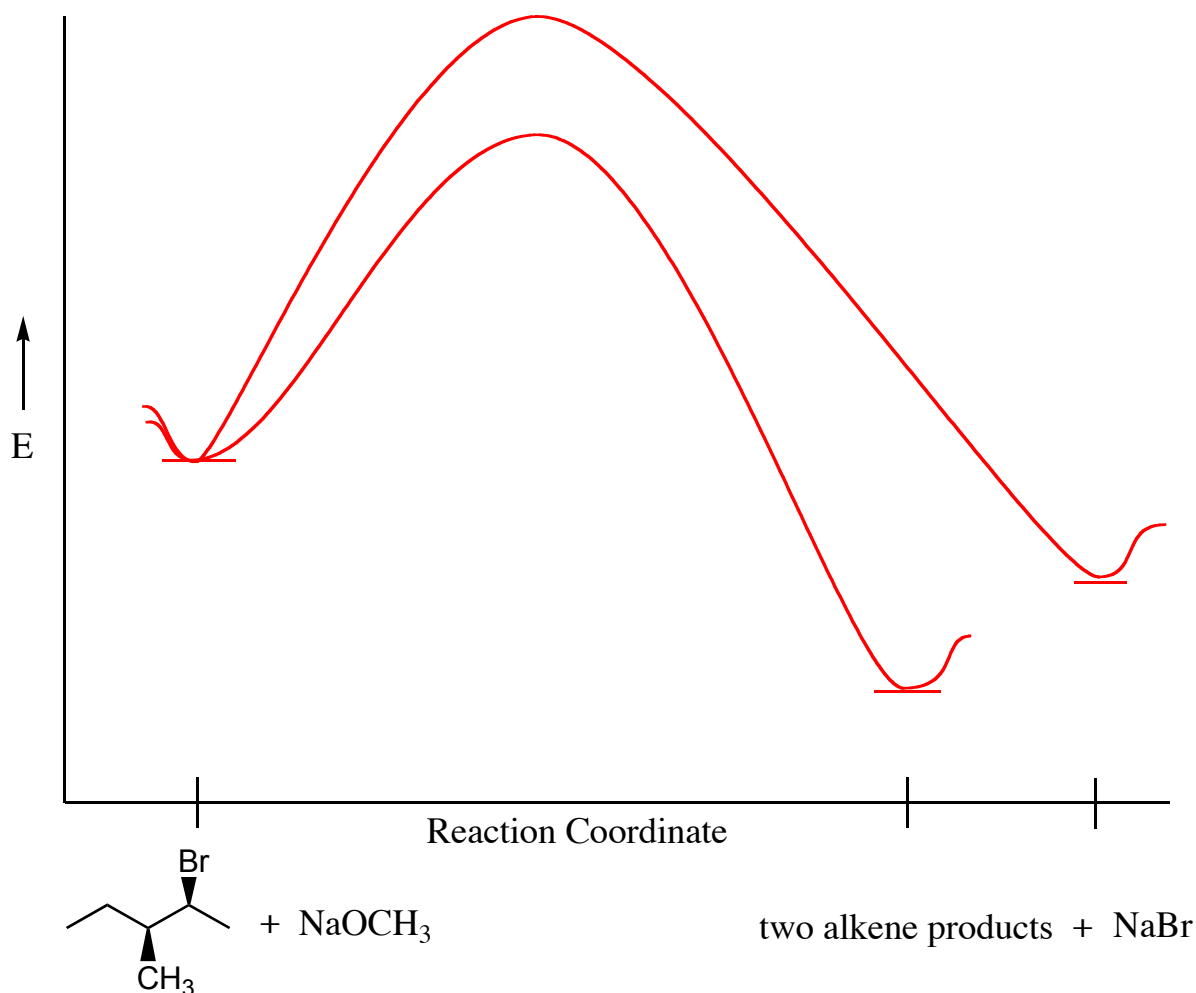


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4 (20 pts) a) When (2S-3S) 2-bromo-3-methylpentane (**1**) is allowed to react with sodium methoxide in methanol, three products are formed in various amounts. One product is an ether, and two products are different alkenes. Give the structures of the three products, showing stereochemistry where appropriate, and **circle the major alkene product**.



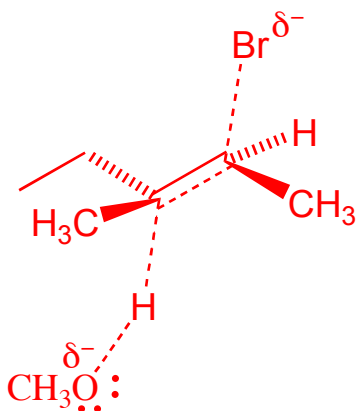
b) Complete the following energy diagram for the reaction leading to the major and minor alkene products. Carefully show the relative energies of the starting material and each of the two products and the two transition states.



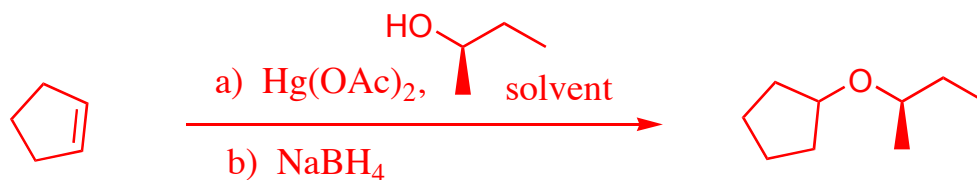
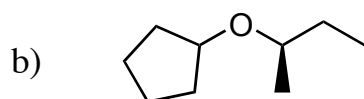
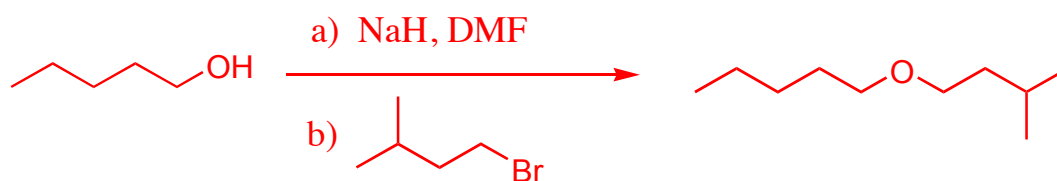
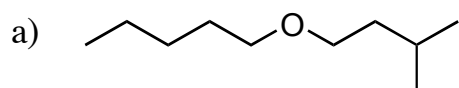
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4. - continued

c) Carefully draw a picture of the transition state leading to the major alkene product. Be sure to indicate the stereochemical structure of the transition state using wedges and dashes.



5 (20 pts) Propose a synthesis of each of the following targets, starting with any organic molecules containing five (5) carbons or less, and any necessary inorganic reagents. Try to make your synthesis efficient (i.e. the target should be produced in the highest possible yield). More than one step may be required. HINT: Try to work backwards from the target to the smaller starting materials, using reactions you know.



5 – continued

